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FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for
CAPSTONE SYSTEM INSTALLATION
as installed in

_____

Make and Model Airplane

Registration Number _____

Serial Number _____

This document serves as a Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped with the Capstone Avionics system. This document must be carried in the airplane at all times when the Capstone Avionics System is installed in accordance with Supplemental Type Certificate No. SA02149AK. The information contained in this document supplements or supersedes the information made available to the operator by the manufacturer in the form of clearly stated placards, markings, or manuals as required by CAR 3.777(b) or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic placards, markings, or manuals or the basic FAA approved Airplane Flight Manual.

FAA Approved: Gregory J. Holt
Manager, Anchorage Aircraft Certification Office
Federal Aviation Administration
Anchorage, Alaska
Date: February 2, 2000

Revision Log						
Rev	**Date**	**Description**	**EN**	**By**	**Auth**	**Chk**
00 -	11/11/99	Initial release, Word 97 SR71	6229	CWH	-	-
01 -	01/28/00	Revision for STC amendment to include MX & UAT radio		CWH		

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LIST OF ILLUSTRATIONS

1. GENERAL

1.1 APOLLO GX60 GPS/COMM DESCRIPTION

The Apollo GX60 is GPS supplemental navigation and communication system with a built-in moving map graphics display. The GX60 is capable of being certified for IFR enroute, terminal, and non-precision approach operation. However, this **installation is limited to Supplemental VFR Navigation only**.

The Apollo GX60 includes a 760 channel VHF communications transceiver in addition to the GPS navigation functions. The comm provides a minimum of 8 watts transmit power and receives the standard NOAA weather channels.

The GX60 GPS/Comm is powered by separate circuit breakers for the GPS and Comm functions from the avionics bus. The GX60 control panel interface (for both the navigation and communication functions) is powered by the GX60 navigation breaker.

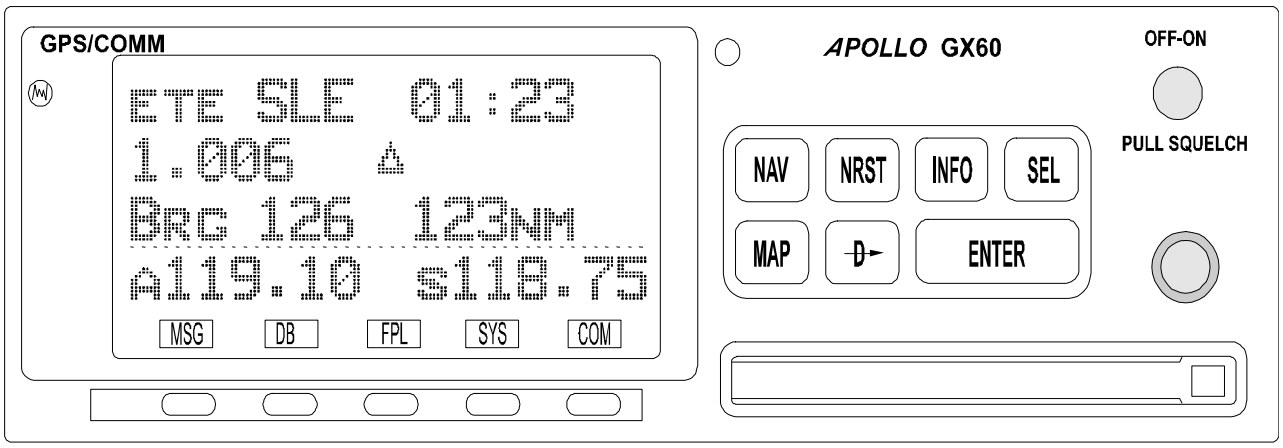

Figure 1 Apollo GX60

1.2 UAT DATALINK RADIO

The Universal Access Transceiver (UAT) is a radio datalink system supporting broadcast services —Automatic Dependent Surveillance-Broadcast (ADS-B). The UAT datalink is a remote mounted radio that provides this communication capability supporting aircraft-to-aircraft or aircraft-to-ground surveillance applications. These include position reports, velocity vector, intent and other relevant information about the aircraft. This type of transmission is referred to as Automatic Dependent Surveillance-Broadcast mode (ADS-B).

The UAT uses two DME style antenna, one on top and one on bottom for communication.

1.3 MX20 MULTI-FUNCTIONAL DISPLAY

The MX20 Multi-Function Display (MFD) is a General Aviation in-cockpit display designed to provide the pilot with a wide variety of situational awareness related information. The display is capable of displaying ADS-B Traffic, Moving Map, Terrain Awareness information and VFR/IFR charting functions. Basic information displayed includes airports, navigational aids, terrain, current flight plan and more. This **installation is limited to VFR Operation only.**

The MX20 includes an internal GPS sensor which provides ownship position on the MFD and detailed positional information to the datalink radio. The MX20 uses the external GX60 for route information and as a backup position source. Should a condition exist, where the internal GPS sensor can not compute position or velocity, the MFD will transition to the external navigator and adjust the datalink message for degraded accuracy.

The MX20 has a built in pre-heat mode (30 seconds to 60 seconds) on each startup below 10C. During the pre-heat mode, the display will remain dark. The pre-heat mode is designed to extend the life of the LCD backlight.

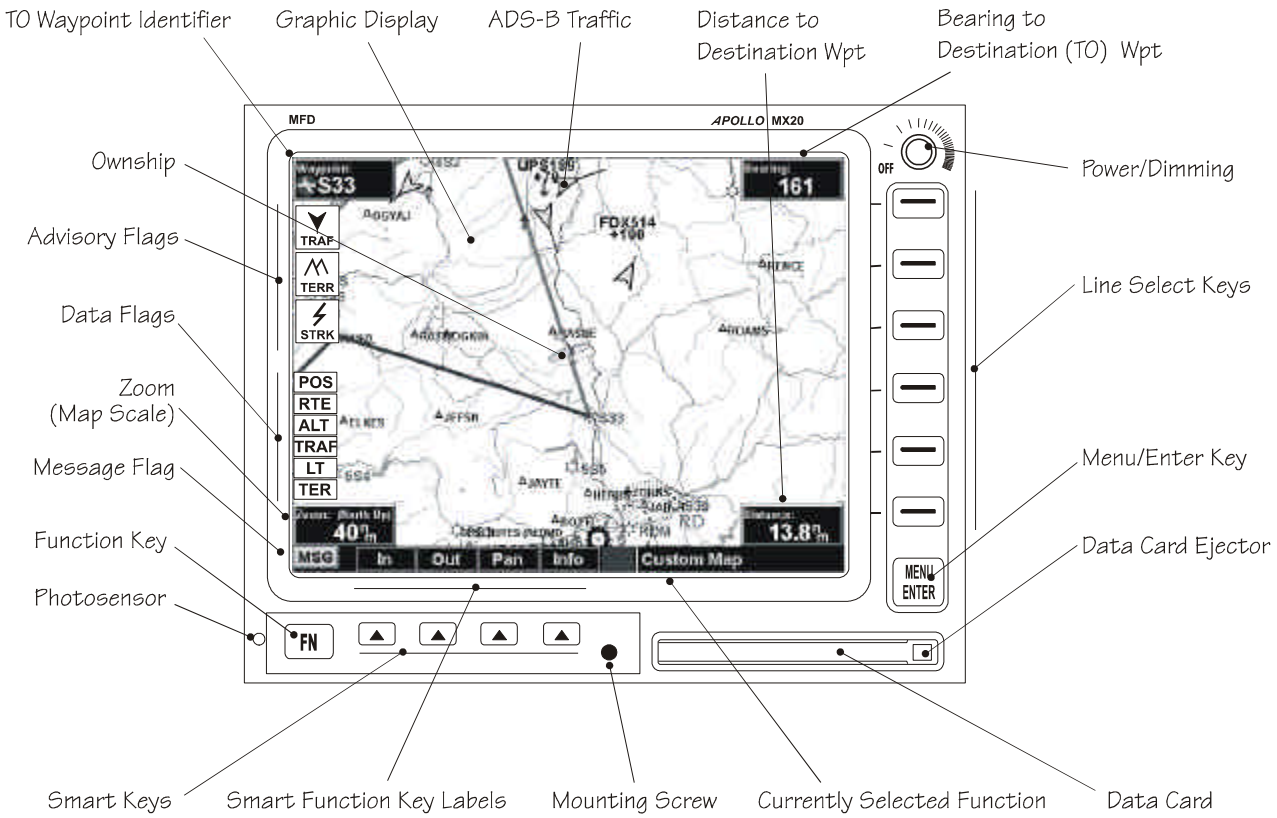

Figure 2 Apollo MX20

2. LIMITATIONS

2.1 GX60 SYSTEM

2.1.1 Operational

This installation is limited to **Supplemental VFR Navigation only**

2.1.2 User Manual

The manuals, or the information contained in the manuals listed below (or later approved revisions), must be immediately available to the flight crew.

- Apollo GX Models 50, 55, & 60 User's Guide..... P/N 560-0961-02
- Apollo GX60 Comm User's Guide Insert..... P/N 560-0963-02

2.1.3 System Software

The system must utilize the software versions listed below (or later FAA approved versions). The software versions can be displayed in the system mode on the GX60 display.

- GX Series Nav Software .....Ver 3.0
- GPS Sensor Software .....Ver 2.3
- VHF Comm Radio Software.....Ver 2.0

2.1.4 Alternate Navigation System

The aircraft/pilot must have other navigation capability appropriate to the route of flight.

2.1.5 Magnetic Variation

a) If the "USING MANUAL MAGVAR" message is generated by the Apollo GX60, the pilot/crew must verify or set manual magnetic variation to the appropriate value.

Note: The automatic magnetic variation (MagVar) correction is not available in the Apollo GX60 GPS above 73° North or below 73° South latitude. All bearing and track information is computed and displayed relative to true north in these polar regions.

2.1.6 Non-Navigation Information

All non-navigation information displayed by the GX60, such as timer/clock and waypoint information (frequencies, runways, approach plates, etc.) is advisory information only.

2.1.7 Foreign Airspace

FAA approval of the Apollo GX60 does not constitute approval for use in foreign airspace.

2.1.8 Placards

Aircraft will have placards identifying each of the following circuit breakers: GPS and COMM. Placards will be placed directly adjacent to the respective breaker. The instrument panel will be placarded as follows "GPS and MFD limited to VFR use only." This placard will be located close to the GPS and MFD units.

2.2 MX20 MULTI-FUNCTION DISPLAY

2.2.1 Operational

This installation is limited to **VFR Operation only**.

2.2.2 User Manual

The manual or the information contained in the manual listed below (or later approved revisions), must be immediately available to the flight crew.

- Apollo MX20 Multi-Function Display User Guide……P/N 560-1026-00

2.2.3 System Software

The system software resides on the front loading datacard. The front loading datacard must be inserted into the unit for operational use and not removed during flight. The system must utilize the software version listed below (or later FAA approved versions). The software version can be displayed in the system mode on the MX20 display under the INFO smart key.

- MX Software.....Ver 1.0

2.2.4 Terrain Function

Navigation and terrain separation must NOT be predicated upon the use of the terrain function. The MX20 is not authorized to provide terrain separation. Terrain data is advisory only. The terrain function is limited to the state of Alaska. Outside the state of Alaska, the terrain data will not be available and the terrain function will be flagged. A MSG at startup will verify the "Unit configured for Special Terrain Mode". The terrain and geography databases do NOT include obstacle and tower data.

2.2.5 Power on Self Test (POST)

The Apollo MX20 performs a self test that the pilot is responsible for reviewing. The MX20 will self test the following functions, which require the following pilot actions:

Self Test - FAIL	Pilot Action
MX20 Program	Turn MX20 power off
Configuration files	Turn MX20 power off
NavData	Turn MX20 power off
Terrain data	Turn MX20 power off
Geography	Turn MX20 power off
Safety Monitor	Turn MX20 power off

Since the capstone equipment is non-essential, if the self-test fails or the MX20 multifunction display or the UAT transceiver are inoperative, the aircraft may depart provided the equipment is turned off.

2.2.6 GPS function

The Capstone system includes a GPS signal splitter between the antenna and the GX60 navigator. The antenna pre-amplifier requires the GX to be turned on in order for the MX20 to receive GPS signals.

2.2.7 Database

The automatic magnetic variation (MagVar) correction is not available in the Apollo MX20 above 73° North or below 73° South latitude. All bearing and track information is computed and displayed relative to true north in these polar regions.

2.2.8 Placard

Placard the aircraft panel, on or near the MX20, with the following placard "GPS and MFD limited to VFR use only". Aircraft will have a placard identifying the MFD circuit breaker. Placard will be placed directly adjacent to the respective breaker.

2.2.9 Foreign Airspace

FAA approval of the MX20 does not necessarily constitute approval for use in foreign airspace.

2.3 UAT DATALINK

2.3.1 Operational

Operation of the datalink radio is limited to the Capstone demonstration area as defined by 66 degrees North, 58 degrees North, 146 degrees West and 168 degrees West within the state of Alaska. Operation of the datalink radio is also authorized in other FAA ADS-B demonstration areas. When operating outside of these areas the UAT datalink shall be turned off. This can be accomplished by pulling the circuit breaker.

2.3.2 Placard

Aircraft will have a placard identifying the UAT circuit breaker. Placards will be placed directly adjacent to the respective breaker.

3. EMERGENCY / ABNORMAL PROCEDURES

3.1 EMERGENCY PROCEDURES

No change. Refer to approved Airplane Flight Manual.

3.2 ABNORMAL PROCEDURES

No change. Refer to approved Airplane Flight Manual.

4. NORMAL PROCEDURES

4.1 GX60 SYSTEM

4.1.1 General

The normal operating procedures for the Apollo GX60 are included in the Apollo GX Models 50, 55, & 60 User's Guide listed in the Limitations section on page 6.

4.1.2 System Switches / Controls

a) Power/Volume/Squelch Knob

The knob on the top right side of the GX60 controls power on/off, volume, and squelch test.

b) Large and Small Knobs

The dual concentric knobs are on the right side of front panel. The large knobs moves the cursor and the small knob changes the character.

c) Hard Keys

The hard keys are the easy touch black keys with white lettering on the right side of the display. These keys include NAV, NRST (nearest waypoint), INFO, SEL (Select), MAP, Direct TO and ENTER.

d) Smart Keys

The smart keys provide custom control for specialized functions. The five small keys are located below the display. The operation of these keys will vary depending on the operational mode.

4.1.3 System Annunciation

a)MSG This is displayed on the lower left corner of the display. Message annunciation will flash when a new message is provided. Press the MSG Smart key to obtain the message. Press the smart key again to return to previous mode.

4.1.4 GX60 Display

a) Messages and all other available information as described in the Apollo GX User's Manual, such as distance to waypoint, groundspeed, time to waypoint, and waypoint and flight plan information, are available on the Apollo GX60 front panel display. The navigation information displays and sequencing rate is user-programmable. The display can also display a moving map function as described in the Apollo GX User's Manual.

4.2 MX20 MULTI-FUNCTION DISPLAY

4.2.1 General

The normal operating procedures for the Apollo MX20 are included in the User Guide listed in the Limitations section on page 7. The pilot shall review and clear all messages after power up.

CAUTION

Caution must be exercised when viewing the map function page in the North-Up mode to avoid disorientation when transferring to a function page presented in the Track-UP mode.

4.2.2 System Switches / Controls

a) Power/Brightness

The power/brightness control is on the upper right corner of the MX20. Pulling out this knob will allow for the brightness to be controlled manually.

b) Function Key **FN**

The function key is located on the lower left corner of the MX20. The function key allows the user to scroll through the available functions.

c) Smart Function Option Keys

The soft keys along the bottom allow for selection of the function as identified directly above it or perform commonly used actions within a function.

d) Menu/Enter Key

The Menu /Enter key is located on the bottom right hand corner of the MX20. Press the Menu/Enter key to show a menu of options to modify the display of the current function. Press the Menu/Enter key again to hide the menu. The Menu/Enter key is also used to confirm entry when user input is required.

e) Line Select Keys

The line select keys are on the right hand side of the MX20. These keys are activated by the Menu/Enter Key. The keys control the various options available to the user.

4.2.3 Display Annunciators

These annunciators are displayed on the lower left hand side of the MX20.

a) "POS" No valid position information is available from the source. Do not expect a valid position representation on the maps. The Ownship symbol will have an "X" through it.

b) "RTE" No valid route (flight plan) is available from the external navigation source. Route (Flight plan) information will not be shown on the maps.

c) "ALT" No valid altitude information is available from the external source. Altitude related functions will not operate, such as terrain awareness.

d) "TRAF" No traffic information is received from the external source. Traffic will not be displayed. Your position information will not be broadcast in ADS-B capable systems.

e) "TER" Terrain coverage is not available for some part of the terrain advisory coverage area. Terrain advisories may not be provided.

f) "MSG" Indicates a message is available on the message page.

4.2.4 Advisory Indications

These are displayed on the upper left hand side of the MX20.

a) Traffic Advisory The traffic advisory flag will appear on the left side of the display when traffic is reported to be within +/- 2000 feet of your altitude and 5nm of your

location. The traffic advisory and traffic functions are only available when the ADS-B system is installed.

b) Terrain Advisory The terrain advisory flag will appear on the left side of the display when the terrain surface altitude is within approximately 500 feet of your altitude and within approximately two minutes of flight in any direction.

4.2.5 Display Information

This display is capable of displaying various functions and many various types of information. This is detailed out in the MX20 Users guide.

4.2.6 Terrain Awareness

For all terrain functions, it is necessary that the aircraft altitude encoder be calibrated on a bi-annual basis. Terrain that is closer than 2000 feet below the aircraft, or any terrain that is above the aircraft, and is within the horizontal range of the MX20, will be displayed. Color variations are used to show terrain heights relative to the aircraft, as follows:

RED	Terrain is at or above your current altitude.
YELLOW	Terrain that is within 500 feet of your current altitude.
GREEN	Terrain that is within 2000 feet of your current altitude.
BLACK	Terrain is greater than 2000 feet below your current altitude.
LT BLUE	NO terrain data is available

4.2.7 Traffic Function

The traffic advisory flag will flash for the first 10 seconds when an ADS-B transmitting aircraft (traffic) is within 5nmi and an altitude band of +/- 2000 ft (traffic annunciation zone) of your aircraft. The traffic advisory flag will stay illuminated until the traffic aircraft is no longer within the traffic annunciation zone.

NOTE

If an aircraft is within the traffic advisory flag “zone” and another aircraft enters the zone, the traffic advisory flag will not flash, but will stay illuminated until all aircraft have left the zone.

Traffic is presented by a cyan (light blue) arrow pointed in the direction of travel. Next to the traffic arrow is the traffic identifier and altitude. A temporary duplicate target identifier will be observed when the target aircraft changes to the “VFR anonymous” mode. The duplicate aircraft will extinguish within 10 seconds of switching the VFR mode selection.

5. PERFORMANCE

No change.